

Abstract of the Disclosure

For fabricating an interconnect structure formed within an interconnect opening surrounded by dielectric material, the interconnect opening is filled with a conductive fill material comprised of a bulk conductive fill material doped with a first dopant element and a second dopant element that is different from the first dopant element. The dielectric material is comprised of a first dielectric reactant element and a second dielectric reactant element. A diffusion barrier material is formed from a reaction of the first dielectric reactant element and the first dopant element that diffuses from the conductive fill material to the walls of the interconnect opening. In addition, a boundary material is formed from a reaction of the second dielectric reactant element and the second dopant element that diffuses from the conductive fill material to the walls of the interconnect opening. The diffusion barrier material and the boundary material form a self-aligned self-aligned skin layer on the walls of the interconnect opening between the conductive fill material and the dielectric material. The self-aligned skin layer prevents diffusion of the conductive fill material into the dielectric material, and the formation of the boundary material prevents diffusion of the second dielectric reactant element into the conductive fill material, such that resistance of the interconnect structure is minimized.